

**DANIEL J. EPSTEIN DEPARTMENT OF  
INDUSTRIAL AND SYSTEMS ENGINEERING**

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**EPSTEIN INSTITUTE SEMINAR • ISE 651 SEMINAR**

***Novel Integrated Optical Modality with Ultrasound  
Transducer for Biomedical Intravascular Imaging***

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and Department of Biomedical Engineering  
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**ABSTRACT**

Atherosclerosis is a complex syndrome characterized by plaques build up on the inner lining of coronary arteries, which is the leading cause of morbidity in developed countries. Diagnosis of atherosclerotic lesions relies on medical imaging techniques significantly.

The clinically approved Intravascular Ultrasound (IVUS) imaging normally operated at 20~40 MHz range, provides resolution no better than 100  $\mu\text{m}$ , which is insufficient for detection of some critical microstructures ( $<65 \mu\text{m}$ ). Increasing the working frequency might be the only feasible solution for higher resolution IVUS imaging. Meanwhile, Intravascular Optical Coherence Tomography (OCT) is a newly developed optical-based modality for high resolution (10~30  $\mu\text{m}$ ) imaging, but it has a limited penetration depth (1 mm). Development of and integrated IVUS-OCT probe and imaging system might be more beneficial than either alone, which could provide superior resolution from OCT for superficial microstructures of the vascular while maintain deep penetration depth from IVUS.

Despite that IVUS and OCT could provide valuable structure information, the composition of plaques is even important for assessment of plaque vulnerability. Recently, we have applied new Photoacoustic (PA) imaging to intravascular diagnosis and proved that Intravascular Photoacoustic (IVPA) offered better contrast on plaque constituents. In this work, the digital fabrication and development of the high frequency ultrasound transducer/arrays and imaging system will also be introduced.

**TUESDAY, JANUARY 10, 2012  
GRACE FORD SALVATORY (GFS) ROOM 222  
3:30 - 4:50 PM**

## **BIO**

Qifa Zhou is currently a Research Professor at the NIH Resource on Medical Ultrasonic Transducer Technology and the Department of Biomedical Engineering at University of Southern California, Los Angeles, CA. Before joining USC in 2002, he worked in the Department of Physics at Zhongshan University of China, the Department of Applied Physics at Hong Kong Polytechnic University and the Materials Research Laboratory at Pennsylvania State University.

Dr. Zhou is a senior member of IEEE and a member of the Ferroelectric Committee, UFFC Society in IEEE. He is also a member of the technical program Committee of IUS in IEEE and photoacoustics in SPIE. He is an Associate Editor of IEEE UFFC. His current research interests include the development of ferroelectric thin films, MEMS technology, modeling and fabrication of high frequency ultrasound transducers and arrays for biomedical imaging applications as well as photoacoustic imaging technology. He has published more than 120 technique papers in this area.